

5. Technology

5.1 Statewide capabilities assessment Plan. Use of the Communications Asset Survey and Mapping (CASM) tool

The State of Montana has had statewide mutual aid procedures in place since 1990, and they provide the strategy for using communications resources in the state. Virtually all, if not all, emergency responders in the state have equipment that is capable of talking on all of the current mutual aid channels. These procedures have been updated many times with the latest revision in June 2005. The Montana Mutual Aid and Common Frequencies Manual addresses the state's data and incident management systems and frequencies assignments for each Defined and/or discussed in the Montana Mutual Aid and Common Frequencies Manual addresses the state's data and incident management systems and frequency assignments for each emergency responder organization within the state. Here is a list of topics covered in the manual:

- General Information, including
 - Authorization
 - Priority Use Levels
 - Color Names
 - Communications Protocols
 - Incident Communications Plans
- Procedures for the following disciplines are addressed, including Incident Communications Plans for:
 - Law Enforcement
 - Fire
 - Emergency Medical Services
 - Disaster and Emergency Services
 - Search and Rescue
 - Amateur Radio
- Management and administration of mutual aid and common frequencies
- Appendices, including:
 - Sample ICS-205 Incident Radio Communications Plans
 - State Common Mutual Aid Frequency Plan
 - National Law Enforcement Emergency Frequency Plan
 - State Law Enforcement Mutual Aid Frequency Plan
 - State Tactical Team Coordination Frequency Plan
 - Fire Frequencies Plan
 - EMS Frequencies Plan
 - DES Direction and Control Frequency Plan
 - Search and Rescue Frequencies Plan
 - Montana Policies and Procedures – Law Enforcement Frequencies



- Montana Policies and Procedures – Fire Frequencies
- Selected FCC Codes
- Sample Interagency Agreement
- Montana CTCSS Tone Plan

As the Interoperability Montana project progresses, the Mutual Aid Handbook will be updated with new procedures appropriate to the new technical environment of P25 and trunking. Ultimately; it will serve as the manual for the entire IM system. Inventories of existing communications equipment already have been conducted as part of the consortium needs assessment. This data is in the process of being added to the CASM system. They are currently being used and will be used even more in the future as additional agencies have communications equipment inventoried and entered into CASM. CASM is also being used to analyze the interoperability of agencies through the CASM matrices. Sources of data entered into CASM include:

- Various Consortium Needs Assessments
- State Agency Needs Assessments
- The Missoula As-Built Assessment
- Current Lewis & Clark County Communications Equipment Inventory

5.2 Plans for continuing support of legacy systems, developing interfaces among disparate systems, and migrating to newer technologies.

The Montana Statewide Interoperability Executive Council (SIEC) selected the technical guidelines to be used in the development of Montana's interoperable communications system as follows: "Open standards are required for interoperability and to define the overall architecture of the system. Industry standards for land mobile radio in public safety use have been prepared under the auspices of the Association of Public-Safety Communications Officials (APCO) and the Telecommunications Industry Association (TIA). This set of standards, known as Project 25 or TIA 102-A, has been selected by the cooperative partnership of the SIEC Concept Demonstration Projects."

Following the direction of the SIEC, agencies within the State of Montana initiated the process of moving all major emergency responders to an integrated, Project 25 (P25) trunked-conventional system. Montana's interoperability initiative began as and continues to be a grassroots, ground-up approach. Although state government is heavily involved in the initiative, the approach, it is a collaborative effort with local jurisdictions, which include Montana's Indian Nations.

Lewis & Clark County, through Concept Demonstration Project 1 (CDP 1) was the first entity to deploy a P25, interoperable infrastructure and is currently in full use of that system. In all, the 56 counties and seven Indian Nations within the state have formed eight consortia (based on geographic proximity) with the primary purpose of upgrading their emergency response infrastructure to P25 trunking to allow for better cooperation and integration. The twelve counties and four Indian Nations along Montana's northern border with Canada make up the Northern Tier Interoperability Consortium and are currently well into the process of building out their compatible system.



During this process, there is an obvious need to continue to support the existing radio systems for these counties, state and tribal agencies, while providing a smooth path for migration to the new system. To this end, the Interoperability Montana project was created, headed by the Interoperability Montana Project Directors (IMPD). All consortia and several state agencies are participants in the IM project, with each represented on the IMPD.

The system combines P25 trunked and conventional technologies to provide interoperable communications among P25 narrowband digital trunked and existing conventional users. At each trunked Radio Frequency site, one repeater is used for interoperability between trunked P25 subscriber radios and conventional subscriber radios. Because of microwave link availability at these trunked sites, a conventional P25 subscriber can talk directly to dispatch in either analog mode or P25 mode. Interoperability between a P25 conventional or analog subscriber and a P25 trunked subscriber is done through a console patch, set up permanently to an “interoperability talkgroup”.

For those agencies wishing to use federal or State of Montana money to purchase communications equipment, all such equipment must be compatible and seamlessly integrate with infrastructure equipment deployed in CDP 1 and CDP 2 (the Northern Tier Interoperability Project). It must operate narrowband in the VHF frequency range and uses a protected high-capacity digital microwave backbone for voice and data interconnect traffic.

The system provides advanced channel management for the shared use of frequencies, seamless roaming throughout the respective trunked areas (footprint) and enhanced responder safety through embedded signaling, while at the same time enhancing interoperable communication with existing legacy VHF radios. At a lower level of interoperability, the existing state mutual aid channels are maintained and available for use.

While all agencies recognize the optimum goal of a trunked system, they will need to migrate to trunking in a stepped or phased approach. With this ultimate goal all agencies will purchase equipment that is trunking capable or upgradeable to trunking. All equipment purchased in the future must be compatible and seamlessly integrate with infrastructure equipment deployed in CDP 1 and CDP2. Progression through these steps will vary in a given time based on operational needs, and ultimately available funding.

This approach allows public safety responders in Montana to exchange voice and data communications on demand, in real time during emergencies and disasters.

Dispatch Centers house the P25 trunked master site equipment as well as the 5-channel trunked RF equipment. Two System Management clients are supplied for System Management functions such as: subscriber/RF infrastructure configuration management, system statistics and reports, system-wide trunked radio traffic usage, and alarm/alert monitoring of the RF infrastructure equipment.

High-Level Transition Plan – From Statewide Needs Assessment

General Recommendations

The following steps were identified to assist state agencies in planning for interoperability:



- Define how the public safety agencies' interests will be represented and coordinated in the IM Project.
- Define the role of PSSB in assisting agencies.
- Continue to track and compare agency needs with consortia improvements, updating needs and opportunities at least once a year.
- Continue to track the activities of the IM Governance Committee. This committee's goal is to meet mandates and accomplish goals that have been set for local and state agency interoperability communications.
- Define the requirements and thresholds for determining how and when agencies should be moved into the interoperability environment (see discussion under Section 0.00. . below).

The following coordination steps were identified to assist state agencies:

- Coordinate requests for infrastructure improvement funding.
- Develop a training program that is available to all agencies but targeted to agencies without ongoing, existing training program.
- Finalize procedures and governance of the statewide re-deployment of surplus radios.
- Standardize requirements for radio purchases that maximize interoperability but allow flexibility for site-specific uses (such as limited, facility-based use).
- Develop a standard site/use agreement that state agencies and consortia can use and implement quickly.
- Develop a teaming agreement format to be used for agencies that are actively participating in IM Projects.

Proposed Transition Plan and Capability Assessment

This assessment has developed an Interoperability Baseline that records the current inventory and capability of participating state agencies; using the information provided by the agencies, the assessment has attempted to define gaps between that baseline and actual interoperability. However, there is still a need to define general functional requirements for interoperability and to get agreement from agencies on these requirements. This process will continue as part of a capability assessment that will explore these needs in more depth using the baseline needs assessment in this report. The capability assessment for each agency will determine when and how the agency will participate in the statewide movement toward interoperability.

Some of these capability assessment needs are specific to each agency but others are related to the overall state system. For example, Highway Patrol capacity needs have been calculated into the capacity plan for the initial rollout of the Northern Tier system, but other agencies will have communication needs that will require adding capacity to the entire statewide system. These demands, and any resources that can be brought to the table to help mitigate these demands, need to be more fully defined in the capability assessment. Administrative aspects of a statewide system will include adding users, setting up talkgroups and getting users on the new system. This will result in additional administrative tasks at the regional and state level, both areas that are currently limited in resources.



The capability assessment is also important to further define state agency system requirements for interoperability. This is definition is critical because state agency involvement in the IM Project differs from agency to agency, and not all agencies are actively planning to use the statewide trunked system.

It was recommended that PSSB and other state agencies identify statewide requirements in the following areas: ²

- **Dispatch Requirements:** Dispatch requirements are more critical to local and county-level interoperability planning, but dispatch requirements were identified by all or most of Montana state agencies. Dispatch needs included back up for those agencies that do not have dispatch as well as potential impacts on those agencies who do have dispatch (such as MHP) and are providing service to other agencies through informal or formal use agreements. Dispatch needs should be refined and, where access to dispatch is critical to agency services, requirements should be established for access to trunked service areas. Another critical need is statewide dispatch for agencies that do not currently have their own dispatch, such as the Dept. of Livestock and Corrections; additional trunking radios will potentially put pressure on the MHP dispatch if they begin to receive additional calls.
- **Command:** Procedures for handling incidents differ among state agencies; some have very specific and written procedures for both internal and external communications to reflect incident command needs. However, confusion still exists among agencies and as to who should be contacted and when during general emergencies. Incident command requirements should be established and should include all agencies and interface needs.
- **Operational:** Business needs should be identified for both agencies and intra-agency communications. All agencies need to have daily operational procedures in writing and radio users should be trained on these procedures as well as how to use the radios. A long-term budget plan should also be started to reflect overall interoperability needs and to help schedule funding requests for both near and long-terms needs.
- **Tactical:** SIEC and the IM Project are setting technical standards; state agencies should adhere to these standards or have business reasons to justify deviation from standards. Agencies should monitor the statewide use and development of these standards.
- **Support:** Agencies should determine the level and frequency of technical support they need to maintain radio communications. Opportunities for pooled support should be explored. In addition, both administrative and technical support is needed to monitor and participate in IM activities.
- **Organizational:** Governance requirements, both inter and intra-agency, should be identified with the goal of enabling the coordination and planning for interoperability

² These requirement categories are recommended by the *Law Enforcement Tech Guide for Communications Interoperability*, USDOJ COPS/SAFECOM, September 2006.



P25 Conventional / Conventional Analog / P25 Trunked Interoperability

Each conventional site will have one (1) P25 conventional repeater to serve P25 conventional subscribers and analog subscribers operating within conventional site coverage areas. The Augusta site will have an existing Quantar upgraded to P25 conventional operation, while solar power sites at Stonewall and Hedges will use new Daniels low-current drain P25 conventional repeaters. Interoperability with P25 trunked subscribers can be achieved by installing one (1) P25 Spectra control station on Sunset Mountain, Belmont, and Hogback trunked sites. Because of microwave link availability at these trunked sites, a conventional P25 subscriber can talk directly to dispatch in either analog mode or P25 mode, through the wire line controlled Spectra control station. Interoperability between a P25 conventional or analog subscriber and a P25 trunked subscriber can be done through a console patch, set up permanently, to an “interoperability talkgroup”. In this interoperability mode, the P25 conventional subscriber should talk in analog mode to avoid a double conversion of P25 conventional audio to P25 trunked audio, and vice versa. Double conversion of P25 audio produces significant degradation of audio quality.

Law Enforcement Center (LEC) Dispatch Center

The Lewis & Clark LEC Dispatch Center houses the P25 trunked master site equipment as well as the 5-channel trunked RF equipment. Two System Management clients for System Management functions such as: subscriber / RF infrastructure configuration management, system statistics and reports, system wide trunked radio traffic usage, and alarms / alerts monitoring of the RF infrastructure equipment.

The LEC Dispatch Center has had upgrades performed on its central electronics bank (CEB) and console operator positions required for P25 trunking, P25 conventional, and conventional analog operation. In addition, five (5) new P25 Spectra control stations have been installed so dispatchers can communicate in P25 trunked mode to trunked RF sites that may be in site trunking. These Spectra control stations controlled through base interface modules (BIMs), enabling dispatchers to access them the same way they would access trunking talk groups or conventional base stations. Each Spectra control station is capable of eight (8) modes that are selectable through standard T8-R8 tone remote control function tones. Each mode can be programmed for one of the following modes: a P25 trunked talkgroup, a P25 conventional channel, or an analog conventional channel.

Three (3) DIUs have been interfaced to the CEB to provide P25 conventional and conventional analog operation for dispatch communications to Stonewall, August, and Hedges conventional radio sites, through the Quantar P25 conventional / conventional analog control stations have been installed at Belmont, Sunset, and East Helena sites.

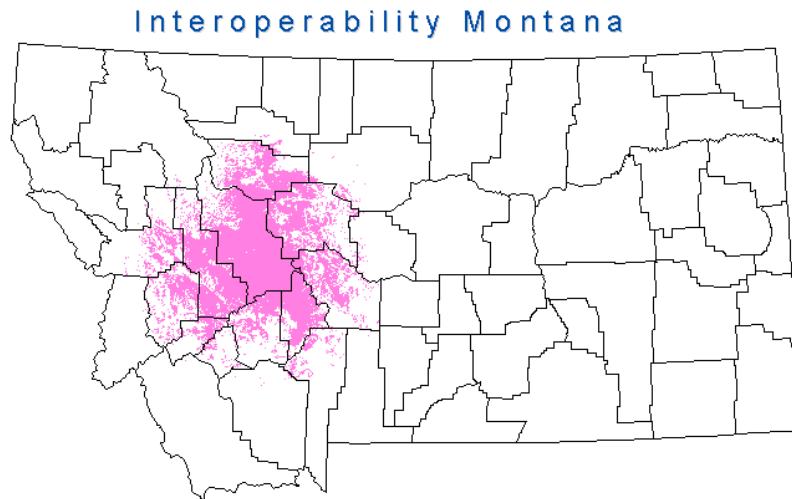
Motorola has provided a UHF Spectra consolette and BIM for communications with the Federal Reserve.



5.2.1 Migration plan for moving from existing technologies to newly procured technologies.

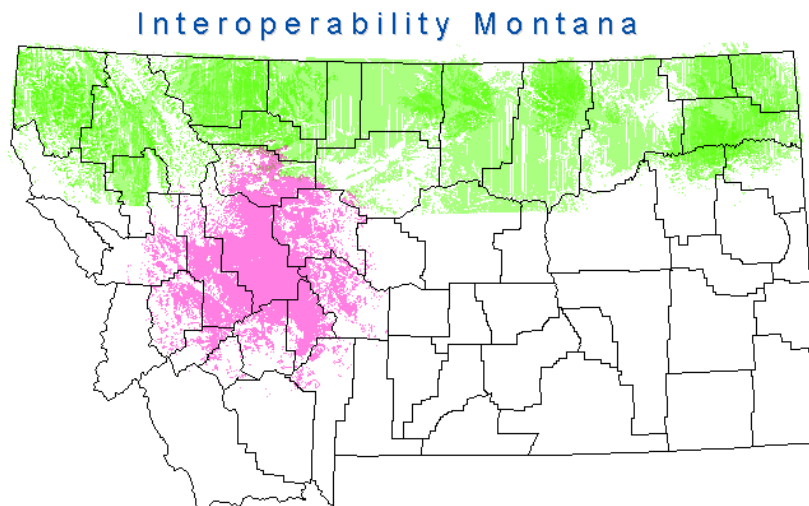
The evolution of the State of Montana Interoperability Communications effort is depicted below:

Figure 12: Interoperability Concept Demonstration Project 1



CDP 1 was completed in Lewis & Clark County and established an eleven-site, P25 trunked-conventional Motorola Smartzone system consistent with the SIEC Definition and Technical Requirements.

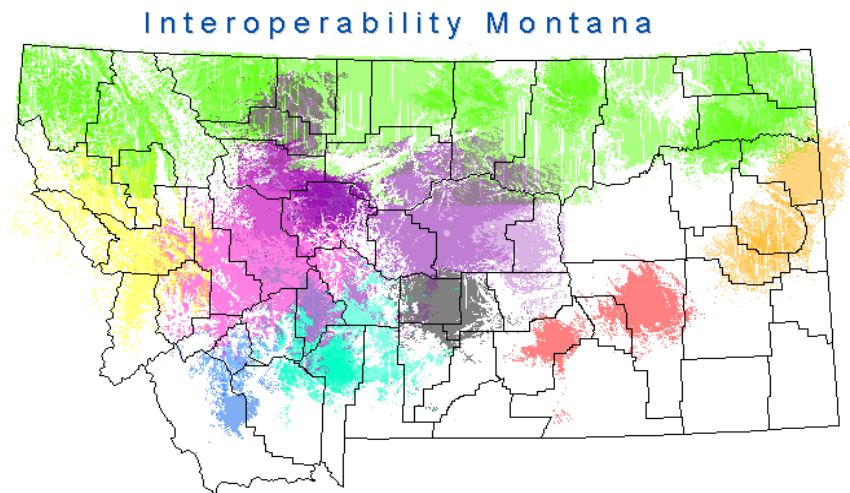
Figure 13: Interoperability Concept Demonstration Projects 1 & 2



CDP 2 is currently under development along the border with Canada and is scheduled for completion in fall 2008, although significant portions of it will be complete and operational by the end of calendar 2007. It builds off of CDP 1 and links twenty-three radio sites into the IM system.

CDP 1 and CDP 2 (when completely operational) will provide a single public safety communications system that serves thirteen counties and four Indian Nations with integrated, interoperable communications along Montana's 550 mile border with Canada.

Figure 14: Final Interoperability Montana Phase 1 Coverage



Currently being planned is the completion of Phase 1 of the IM project, which will close several “rings” of microwave backbone across the state as well as provide new P25 trunked-conventional capabilities for a number of additional counties, tribes, and jurisdictions. This is anticipated to be complete after 2008, but 2008 will see the completion of several important sections. More than 50 percent of Montana will be covered by IM Phase 1.

Over the next year, plans will begin in earnest for Phase 2 of the IM Project, which will build out the State of Montana’s interoperable radio system into those counties, Indian Nations, and jurisdictions not covered by Phase 1. In each county and Indian Nation, all emergency responders are slated to be migrated to P25, trunked systems before 2013. The system being rolled out will have an “interop repeater” installed at each trunked location to allow those users still on P25 conventional equipment to migrate to the new system even before they have trunking-capable radios. Over time, more and more trunking-capable subscriber units will be rolled out across the state.

Although the exact details of the Phase 2 plans are not yet known at this time, in general they will follow the existing strategy of the IMPD for approving sites and finding funding. We will do as much as we can with the funding available. The State of Montana has already allocated 8.5 million new dollars for the IM project, and when completed, tower sites will be turned over to an agency (usually the local county or Indian Nation) for maintenance and support. The Montana Highway Patrol has already committed to supporting and maintaining the statewide microwave system.

The timeline for the statewide build-out is as follows:

Fall 2007

- Partial completion of the Northern Tier (Lincoln, Flathead, Glacier, Toole, Liberty, Hill, Blaine, Phillips, Valley, Daniels, Sheridan, and Roosevelt Counties and the Blackfeet, Rocky Boy’s, Fort Belknap, and Fort Peck Indian Nations).
- Partial completion of Central Consortium Sites (Pondera, Chouteau, Cascade, Fergus, and Judith Basin Counties).
- Partial completion of the Western Consortium (Sanders, Mineral, Ravalli, Missoula,



and Lake Counties and the Flathead Indian Nation)

- Partial completion of the Eastern Tier (Garfield, Custer, Powder River, Carter, Dawson, Fallon, Wibaux, Richland, Prairie, and McCone Counties).
- Partial completion of the Tri-County Consortium (Powell, Jefferson, and Broadwater Counties).
- Partial completion of the Big Sky 11 Consortium (Yellowstone, Big Horn, Treasure, Petroleum, Rosebud, Stillwater, Musselshell, Carbon, Wheatland, and Golden Valley Counties, and the Crow and Northern Cheyenne Indian Nations).
- Partial completion of the I15-90 Corridor Consortium (Granite, Deer Lodge, Silver Bow, and Beaverhead Counties)
- Partial completion of the South-Central Montana Consortium (Meagher, Sweet Grass, Park, Gallatin, and Madison Counties).

5.2.2 Process to ensure that new purchases comply with the statewide plan.

All counties in the State of Montana and Indian Nations within the geographic boundaries of the State of Montana are members of an Interoperability Consortium, and all consortia are members of the Interoperability Montana (IM) Project. Each consortium has a representative who sits on the Interoperability Montana Project Directors (IMPD) board. As part of the IM Project, each consortium has committed to purchasing only P25, trunking-capable (or upgradeable) equipment in the future. In addition, federal and state funding for interoperable radio equipment is limited to P25-capable or –upgradeable equipment.

As mentioned in Section 5.2.1, existing conventional equipment will continue to serve its function after migration to the new system through the deployment of interop repeaters that will allow remaining conventional equipment to operate on the new system provided they are P25 compatible. **Figure 15**, next page, graphically depicts the process local entities go through in Montana to receive approval to proceed with communications procurement and deployment when federal or state funds are used

The IMPD, along with the IM Technical Committee (IMTC) is working to ensure the equipment purchased by agencies within the state is compatible and aligned with the SIEC technical guidelines. In the diagram below illustrates that, as consortia make decisions about equipment and radio sites, those decisions are reviewed by the Interoperability Montana Technical Committee (IMTC). The IMTC then issues recommendations to the IMPD concerning equipment to be purchased and tower sites to be constructed.

Availability of funding plays a big part in the communications identification and procurement lifecycle. Funding is needed to conduct needs assessments, pay for personnel, fund construction and purchase equipment. Prior to construction, a pre-award letter is issued which documents the responsibilities of the agency that will receive the equipment after completion of the site. Transfer of ownership for the equipment will be to a local entity, usually a county or Indian Nation, unless the local entity refuses to accept the equipment. This transfer also imposes financial responsibility for maintenance of the equipment to the accepting agency.



If a local entity determines it cannot or does not want to take ownership of a radio site, other counties or Indian Nations are contacted to see if they will accept responsibility for the equipment. If no local entity is found, the equipment is offered to a state agency. Although Montana has not encountered a situation where no agency was willing to accept responsibility for a site, in the event that did occur, the site would not be built and a different location would be selected. Once construction is completed, all the equipment installed, and User Acceptance Testing approved, transfer of the equipment occurs and the accepting agency assumes maintenance responsibility.

Figure 15: IMPD and Local Interaction for Approval to Proceed with Radio Communications Projects

